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Semiconductor Policy Brief

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The semiconductor industry was born in the 1940s, mostly due to publicly funded research and development as well as large-scale public acquisition programs for space and military applications. Today, the public sector supports the industry in similar ways, with acquisitions for military, surveillance, and some scientific applications, in addition to various incentives for domestic investment through the tax code.

However, yesterday's industrial policy cannot ensure that public investments will lead to broadly shared prosperity, nor can it ensure that the U.S. remains a global leader in the rapidly changing semiconductor industry. For instance, chips are now specially tailored for a given application, meaning that we can no longer view semiconductors as a single category of general-purpose technology. This increases the risks and uncertainty of investment in semiconductor production since chip specialization requires investment in unique equipment and production techniques, which are more expensive and less adaptable to changing market conditions. Market demand for cutting-edge chips is growing, and consequently, investment in production capacity for these chips has also been growing. Older-generation chips remain a key resource for numerous applications, but low profit margins, high fixed costs, and uncertainty about future demand have created unfavorable conditions for investment in domestic production capacity, which has led to the current chip shortage.

Additionally, chip specialization means that the paths of technological change in hardware and software are now closely linked, and we can no longer take for granted socially beneficial spillovers from industrial development. Observers have documented a narrowing of research driven mainly by the needs of tech giants. Maintaining diversity in research is essential for both long-term dynamism and shaping the direction of technological development for the public good.

This also has serious implications for the future of employment. U.S. employers already largely refuse to sufficiently invest in workforce development, and some trends in A.I. development are likely to worsen this problem. Many applications for A.I. in the workplace involve a two-pronged strategy to legally redefine the employer–employee relationship and to use algorithmic management techniques to extract the maximum possible work effort from a low-wage, high-turnover workforce. This approach does nothing to augment the skills of low-wage workers, or to create pathways for non-college-educated workers to a stable middle-class life. Instead, these methods are designed to allow firms to more closely monitor low-wage workers, to shift the costs of idle time onto workers, and to avoid the legal obligations of traditional employment. In short, policy choices designed to weaken worker power have left much of the potential talent pool for high value-added production trapped in low-wage, dead-end employment.

When taken together, these problems portend a future where existing trends of decelerating productivity growth, loss of core manufacturing capacity overseas, and stagnating wages lead to the U.S. falling away from its position of technological leadership. These are complex and multifaceted issues, which require similarly complex policy responses. We propose the strategy outlined below.

Expand the domestic market for semiconductors by addressing chronic underinvestment in U.S. digital infrastructure

While a substantial amount of growth in demand for semiconductors is expected to come from the auto and advanced manufacturing industries, the public sector can also drastically increase domestic demand through acquisition programs that align with the social good. Modern digital infrastructure requires procurement programs for sensors, wireless devices, data-storage centers, high-performance cloud-computing centers, and a wide variety of other semiconductor technologies. In other words, meeting our currently unmet social needs in infrastructure ensures a sizable and consistent market for the semiconductor industry. This will make domestic investment in semiconductor manufacturing capacity more attractive, particularly since close collaboration between fabrication and design is important for meeting the requirements of many applications. Specific projects include:

- Retrofit U.S. physical infrastructure with real-time monitoring, allowing for rapid response to extreme weather events
- Guarantee safe environmental conditions by equipping schools and public buildings with systems to monitor and purify air inside buildings, and ensuring public accountability of these systems by storing their performance data in a cloud-hosted database
- Upgrade the information systems and the diagnostic equipment in U.S. public-health institutions, such as public hospitals and community health centers
- Expand programs for high-performance computing (HPC) in public healthcare and physical sciences research, and establish new HPC programs for the social sciences
- Overhaul the information systems for U.S. administrative data for income and employment, and bring the fragmented state level systems into a single, integrated national system
- Create a public option for broadband in areas where private providers have failed to invest

Create the workforce of the future with public employment, apprenticeships, and worker power

Anti-worker exceptionalism in the U.S. has removed much of the incentive for private firms to invest in workforce development. The lack or weakness of labor institutions such as unions and workers councils has also hindered workforce development. In other highly developed nations, these institutions play important roles in administering and directing resources to training programs. Firms are reluctant to spend money on training since it is costly and there is no guarantee that they will ultimately see the benefits of that investment if workers leave for other firms. Additionally, many existing business models rely on strict monitoring to increase worker effort, with no incentive to invest in upskilling their workforce whatsoever. On the other hand, placing the costs of training on individuals subjects them to risks that often cannot be justified unless stable income from employment is assured. This combination of policy failures has left the U.S. structurally incapable of creating the good, high-productivity jobs that will form the basis of U.S. leadership in the semiconductor and related industries, and that can provide a high standard of living for people without college degrees.

The public sector can solve these problems by creating new employment opportunities that include requisite training through apprenticeship programs, all connected with the public-sector investments we outlined above. Meeting the needs of these projects will require expansions to direct public-sector employment as well as the creation of additional jobs via contracting with the private sector. Combining public employment with apprenticeships and training programs implemented in partnership with public universities, community colleges, and labor unions both takes the risks of training off of individuals, and creates well-paying jobs. This also creates spillover benefits to private industry, building a workforce with skills that are readily transferable to advanced manufacturing industries, where talent is consistently rated as the key factor in maintaining global competitiveness.

The role of unions and labor institutions in maintaining the workforce and shaping the direction of technological development must also be expanded. Unions put upward pressure on wages, which not only has obvious benefits to workers but also forces employers to either make continuous improvements in labor productivity, or be forced out of the market. Therefore, unions play a key role in industrial policy, since market winners and losers are determined by which firms make the most productive use of resources—and not by which firms boost profits by crushing their own workers most efficiently. The PRO Act is an essential piece of legislation that would expand union membership and worker power in a number of ways. Additionally, it creates provisions for multi-employer unionization, which is important both for blocking firms from pushing inefficiency up or down in their supply chain, and for ensuring a fair deal for workers at all points in production. Unions must also be viewed as partners in workforce development, and should play a role in administering apprenticeship and training programs.

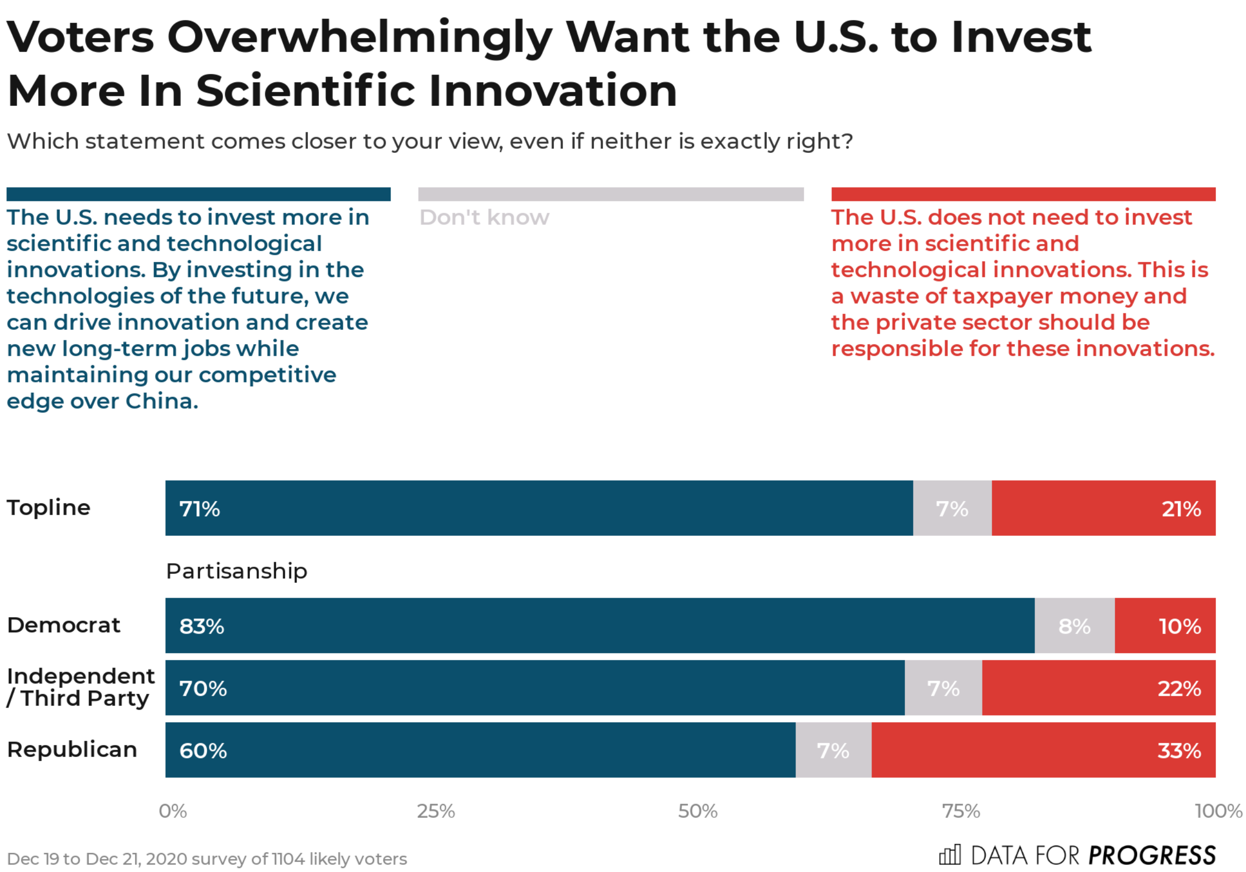
Growth of the semiconductor industry will largely depend on the growth of advanced manufacturing industries in the U.S. that make extensive use of computing technologies. However, without comprehensive policy to target expansion of high-productivity jobs, U.S. industry will not be able to continue to compete globally, nor will it be able to create well-paying, middle-class jobs.

Expand the scope of public research in computing

Public research has always played an important role in advancing the technological frontier as well as in facilitating the absorption of frontier technology into broad application. Currently,a significant portion of public research in computing is oriented toward defense and surveillance applications. There are also notable programs for computing in health research and the physical sciences, which should be significantly increased. The public sector should also expand the role of public research in computing for the social sciences through a system of research institutions similar to the National Labs. The coronavirus pandemic highlights the need for rapid evaluation of public policy, and this requires integrating data from many sources, applying advanced computational techniques, and disseminating results to the public in a digestible manner. Advances in measurement and computing mean that we now have the ability to assess policy along a number of different dimensions of noneconomic benefits and costs, as well as understand the tradeoffs between various socially desirable outcomes. We should recognize that conflict over such tradeoffs is an important part of the political process and that high-quality analyses that can properly account for effects of policy across all the relevant dimensions is essential to informed decision making.

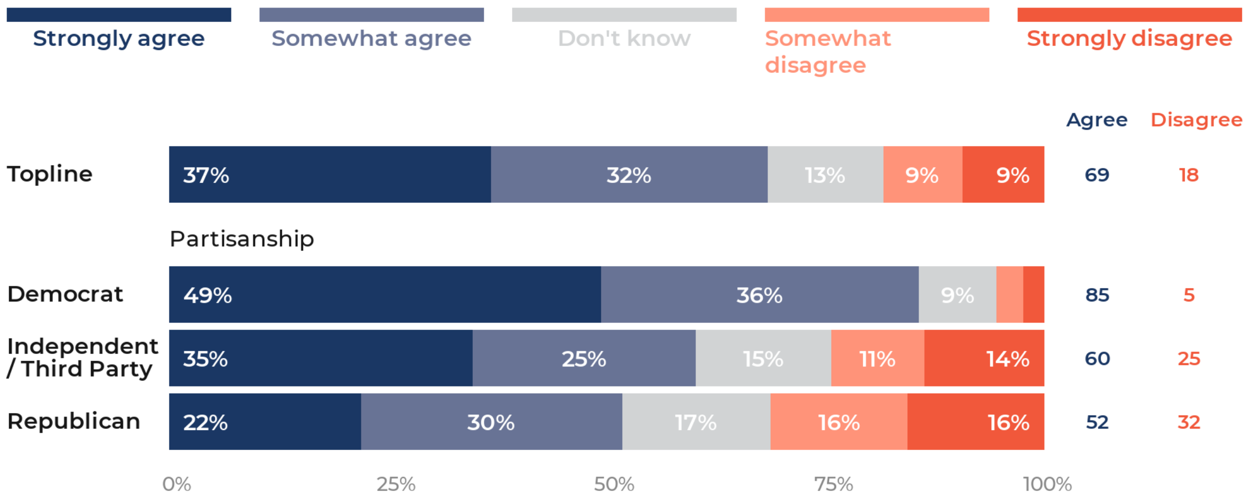
Substantial public research must also be directed at identifying and developing applications for labor augmenting technology. This is a key component in creating an economic system where jobs that are high productivity and fulfilling are accessible to more workers than those with college degrees. We have noted that worker power, public employment, and apprenticeships play an important role in creating these kinds of jobs. In addition, the public sector should conduct basic research in labor augmenting technologies and promote their adoption in industry, as it has done in the past for labor replacing technologies.

Polling:



A Majority of Voters Think America Should Ramp Up Climate Actions if China Does So Too

If China decides to take more actions to address climate change and transition to clean energy, like ramping up production of solar panels and electric vehicles, do you agree or disagree that America should also take more actions to address climate change and transition to clean energy?



Dec. 8 to Dec. 9, 2020, survey of 1,040 likely voters

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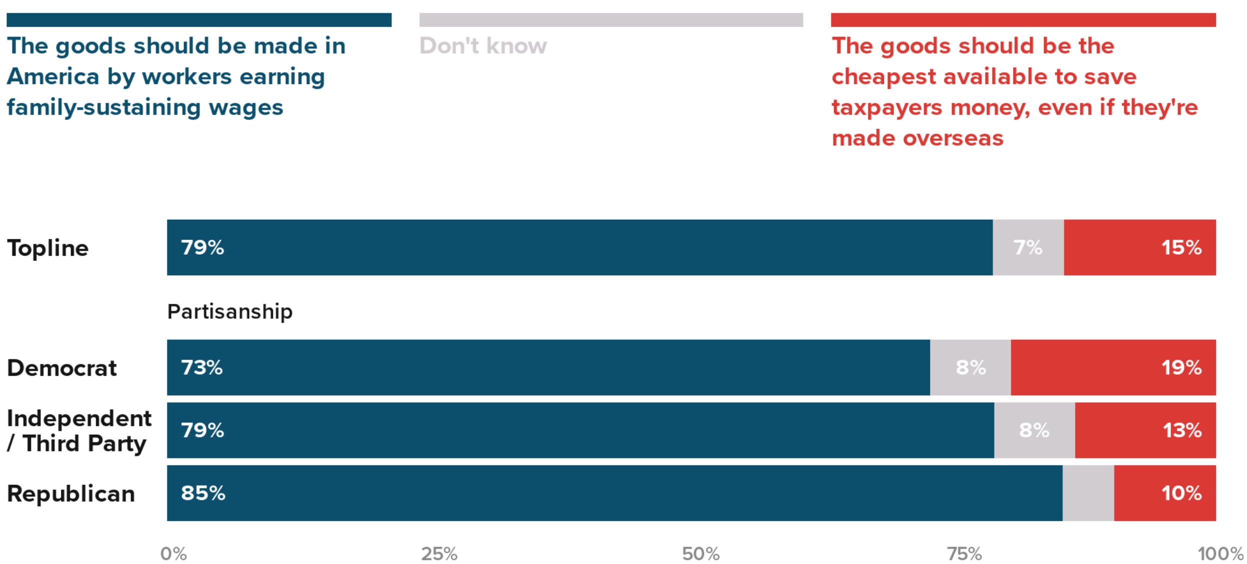
Voters Want the Government to Purchase American-Made Manufactured Goods

When thinking about the purchases and investments in manufactured goods that the government purchases with taxpayer dollars, which is more important to you:



Mar 10 to Mar 12, 2021 survey of 1566 likely voters

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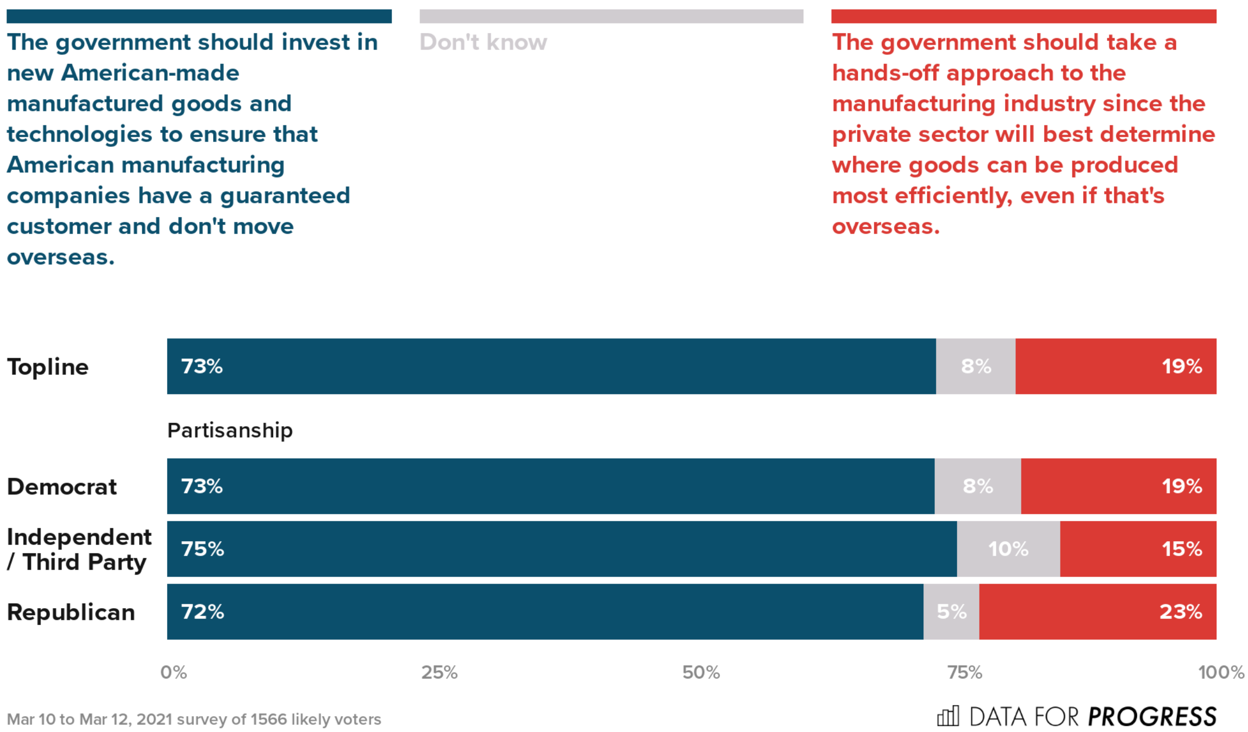
Voters Want the Government to Invest in American-Made Manufactured Goods

Which statement comes closer to your view, even if neither is exactly right:



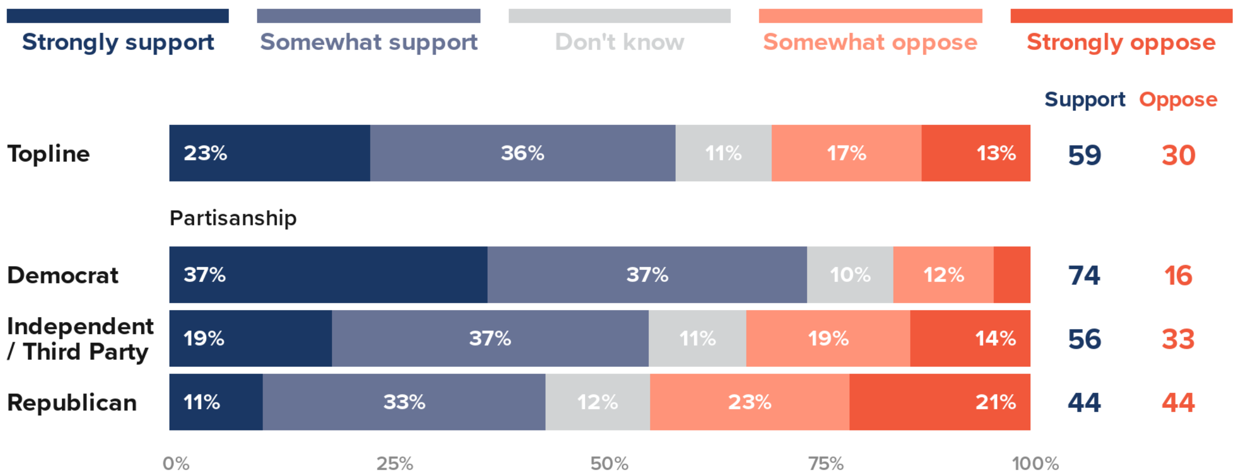
Voters Support a Federal Investment to Catalyze American Semiconductor Production

Some federal lawmakers are proposing spending $100 billion to retrofit schools with indoor air quality monitors, upgrade the information systems in public health facilities, and modernize infrastructure to include sensors that can monitor extreme weather events in real-time.

Supporters of this proposal say that these projects will deliver much-needed upgrades to our nation's infrastructure and create good-paying jobs. They say these projects will involve large purchases of American-made semiconductors and can prevent semiconductor manufacturing facilities from being moved overseas.

Opponents of this proposal say that this is wasteful spending which will increase the national debt and put a financial burden on future generations. They say that the government is too incompetent to manage this project and the private sector would make better investments.

Do you support or oppose this proposal?



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